

**WATER TABLE.** See DRAINAGE; GROUND WATER.

**WATER TURBINE.** See TURBINE (Water Turbines).

**WATER TURKEY.** See DARTER (bird).

**WATER VAPOR.** See EVAPORATION.

**WATER-VASCULAR SYSTEM.** See ECHINODERM.

**WATER WHEEL** changes the energy of falling water into mechanical energy which can be used for running machinery. The best source of water power in nature is found in waterfalls and rapids in rivers. The water is directed into the wheel through a chute. The wheel is mounted on an axle, which is connected by belts or gearing with the machinery it is to operate.

There are two main types of water wheels, vertical and horizontal. The vertical wheels include the overshot and the undershot.

The overshot water wheel has many scooplike buckets around its edge. Water is delivered to the top of the wheel. The weight of the water falling into the buckets causes the wheel to turn. An overshot water wheel may have an efficiency of up to 80 per cent. That is, it may turn as much as 80 per cent of the energy of the water fed to it into mechanical energy.

The undershot water wheel is built so the water strikes against blades at the bottom of the wheel. The power of the wheel depends on the speed of the water as it strikes the blades. The undershot wheel has such a low efficiency that it is rarely used.

Most modern water wheels are horizontal. A horizontal wheel rotates on a vertical shaft. It is driven by the force of the water striking the blades on one side of the wheel. Horizontal wheels are highly efficient if properly designed for the conditions of their use.

Historians believe the water wheel was developed in the 100's B.C. It was used mainly to grind corn. Later it was used for many kinds of mechanical operations. It was a major source of power until the development of the steam engine in the 1700's.

RAY K. LINSLEY

See also WATER POWER; TURBINE (Water Turbines).

**WATER WITCH.** See GREBE.

**WATER WONDERLAND.** See MICHIGAN.

**WATERBUCK.** See ANTELOPE (Kinds).

**WATERBURY**, Conn. (pop. 108,033; met. area 216,808), is called the *Brass Center of the World*. It lies on the Naugatuck River, 25 miles (40 kilometers) north of Long Island Sound (see CONNECTICUT [political map]).

Waterbury ranks first among the cities of the United States in the manufacture of brass and copper goods, brass casting, sheet and rolled brass, and other brassware products. Waterbury mills make the "blanks" for United States nickels and the coins for many South American countries. Other products include buttons, clocks, and foundry and machine-shop products.

People from nearby Farmington bought the Waterbury area from Indians in 1674. They established a frontier outpost called *Mattatuck*. The name became Waterbury when the town was incorporated in 1686. The manufacture of brass goods began in 1802. Waterbury received its city charter in 1853. It has a mayor-council type of government.

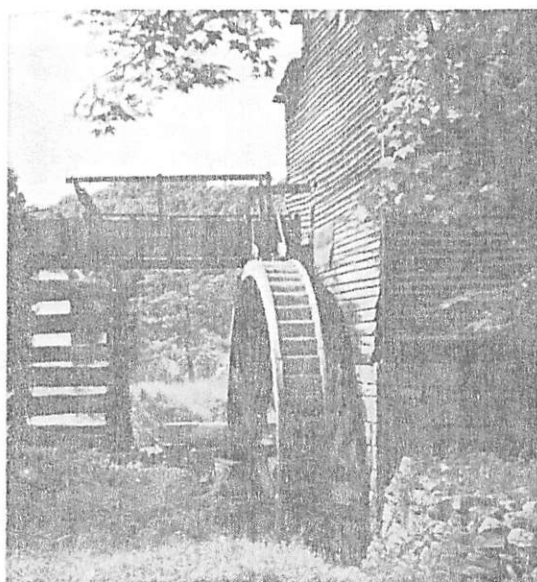
ALBERT E. VAN DUSEN

**WATERFALL** is any sudden descent of a stream from a higher to a lower level. In wearing down its channel, a river uncovers certain layers of rock that are softer than others. If the hard rock is farther upstream than the soft, the channel below is worn more rapidly, and a waterfall results. Sometimes the hard ledge forms the edge of a vertical cliff, over which the water plunges.

If the volume of water is small, the fall may be called a *cascade*. If the volume of water is large, a fall of this sort is called a *cataract*. Niagara Falls is such a cataract. Other noted cataracts are Victoria Falls on the Zambesi River in Africa, the Falls of the Iguazu near the Paraná River in South America, and Churchill Falls of the Churchill River in Labrador. Usually, however, the term *cataract* is applied to a series of rapids or falls caused by the flow of the stream over a rapidly sloping rocky bed. Examples of these are the cataracts of the Nile and the Orinoco rivers. Cataracts which have small, gradual falls are termed *rapids*. Some of the most noted rapids in North America are those at Sault Sainte Marie, at the outlet of Lake Superior, and the rapids in the Saint Lawrence River.

Small waterfalls or cascades are often of great height. Such are the Upper Yosemite Falls in California, 1,430 feet (436 meters) high; the Sutherland, New Zealand, 1,904 feet (580 meters); and the Staubbach of the Alps, 984 feet (300 meters). Some lower waterfalls are noted for their beauty. These include Montmorency Falls, near Quebec; Multnomah Falls, near the Columbia River, Oregon; numerous cascades in the Rocky and Selkirk mountains; and the Upper and Lower falls in Yellowstone National Park.

Falls usually occur in mountainous countries. But sometimes they are caused by the descent of streams to a flood plain. The line along which several rivers flowing into the same body of water descend to this lower level is called the *fall line*. The fall line of those rivers south of Chesapeake Bay which flow into the Atlantic Ocean is marked by the location of manufacturing cities whose sites were chosen because they were near water power, which later became even more valuable as hydroelectric power. Examples of these industrial centers are Rich-



Ewing Galloway

This Old Overshot Water Wheel in West Virginia is still in use more than 150 years after it was first put into service.